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The Swifts of Rancho Grande, North-central Venezuela,
with Special Reference to Migration.¹

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(Plate I; Text-figures 1-3).

[This is one of a series of papers resulting from the 45th, 46th and 47th Expeditions of the Department of Tropical Research of the New York Zoological Society, made during 1945, 1946 and 1948, under the direction of Dr. William Beebe, with headquarters at Rancho Grande in the National Park of Aragua, Venezuela. The expeditions were made possible through the generous cooperation of the National Government of Venezuela and of the Creole Petroleum Corporation.

[The characteristics of the research area are in brief as follows: Rancho Grande is located in north-central Venezuela (10° 21' N. Lat., 67° 41' W. Long.), 80 kilometers west of Caracas, at an elevation of 1,100 meters in the undisturbed montane cloud forest which covers this part of the Caribbean range of the Andes. Adjacent ecological zones include seasonal forest, savanna, thorn woodland, cactus scrub, the fresh water lake of Valencia, and various marine littoral zones. The Rancho Grande area is generally subtropical, being uniformly cool and damp throughout the year because of the prevalence of the mountain cloud cap. The dry season extends from January into April. The average humidity during the expeditions, including parts of both wet and dry seasons, was 92.4%; the average temperature during the same period was 18° C.; the average annual rainfall over a 5-year period was 174 cm. The flora is marked by an abundance of mosses, ferns and epiphytes of many kinds, as well as a few gigantic trees. For further details, see Beebe & Crane, *Zoologica*, Vol. 32, No. 5, 1947. Unless otherwise stated, the specimens discussed in the present paper were observed or taken in or over the montane cloud forest zone, within a radius of 1 kilometer of Rancho Grande.]

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INTRODUCTION.

In all of South America there have been recorded (Peters, 1940) nine genera of swifts, divided into twenty species and a total of thirty-three kinds, including subspecies. In Venezuela Mr. William H. Phelps informs me there are six genera, of thirteen species of twenty kinds, if we include subspecies. Of these Venezuelan birds, within an area of less than one square kilometer with its center at Rancho Grande, I have recorded eight species of five genera; roughly eighty per cent. of the genera and sixty per cent. of the total Venezuelan species of swifts.

Late in the year 1937 Dr. Alexander Wetmore (Wetmore, 1939) spent some time collecting birds near Rancho Grande, and I quote the following notes concerning the swifts.

"In Tropical America swifts are tantalizing birds usually seen out of range . . . On November 4 at Rancho Grande several (*Chaetura brachyura*) circled out of range. This species appears very black as it flies overhead, so that at first glance it suggests the black swift (*Nephoecetes niger*), but a second look distinguishes it by the shorter, light-colored tail. The specimen taken, a male, measures as follows: Wing 118.7, tail 29.0, culmen from base 5.8, tarsus 11.8 mm."

Concerning *Streptoprocne zonaris albicincta*, he writes, "While I was collecting in Portachuelo above Rancho Grande on November 3, 6 and 10, groups of these large swifts dashed at intervals through the pass at lightning speed with a great rushing of wings. Occasionally I observed them circling in air."

These are, I believe, the only published notes on swifts in this restricted area.

My thanks go to Mr. William H. Phelps for the loan of skins of rare swifts, to Dr. Neal Weber for names of ants in the food of birds taken in 1948, and to Dr. J. Bequaert for the name of the feather fly found on *Aëronautes*. The three text-figures are the work of Miss Louise A. Moore. The photographs were taken by Miss Jocelyn Crane.

Streptoprocne zonaris albicincta

(Cabanis, 1862).

Giant White-collared Swift.

Species Range: Southern Mexico and the Greater Antilles, south over northern South America to British Guiana, north Matto Grosso and Peru; vertically to more than ten thousand feet in the Andes.

Subspecies Range: Five subspecies are recognized, of which *albicincta* occurs at Rancho Grande. Its range is extensive, from Honduras south to British Guiana, northern Matto Grosso and Peru, together with the islands of Granada and Trinidad. In Venezuela, Mr. Phelps records it as inhabiting the northern mountains.

Field Characters for Sight Identification: The most unmistakable species, distinguished by great size and white nuchal collar. It measures eight to nine inches in length, as compared to the five-inch average of the seven other species. *Panyptila* is the only other Rancho Grande swift with a white collar, but is about half the size of *albicincta*, and has a deeply forked tail. In young giant swifts the collar is reduced and indistinct in flying birds.

Occurrence: February 22 and September 9 are the earliest and the latest dates of our occupancy of Rancho Grande throughout three years. On both dates I recorded giant swifts within sight of the laboratory. Seldom did a day pass between these extremes when one or more did not come into view. Soon after we opened the station I ceased keeping detailed notes on these birds, as their visits seemed governed by no regularity.

They commanded attention under four separate conditions: (1) Almost daily either singly, but usually in small flocks, they hawked in the sky after insects, or (2) they flew headlong through Portachuelo Pass, low over the trees. (3) They entered rarely into the diet of a pair of resident bat falcons, *Falco albigularis*, and (4) on nights of storm, rain or neblina they occasionally struck against the windows of our lighted laboratory. Throughout the seven months during which we carried on our observations, there was no marked period of absence or extreme scarcity of these swifts. The breeding period must have occurred throughout part of this time but it was not noticeable in the rarity or abundance of individuals or flocks.

When it became evident that Portachuelo Pass was used as a migrating flyway on an unprecedented scale by other birds and by insects, I watched and noted these passing swifts for a period of several weeks, to see if there was any definite factor or sequence in their numbers or movements.

The daily, circling, feeding birds whose general direction was indefinite, varied their elevation, high or low, according to the volant stratification of edible insects. This proved to be definitely associated with the southward migration of insects of many orders through the pass. The swifts often joined flocks of

swallows and even of large dragonflies where, on clear days, the migrants offered rich feeding in the area of the pass. At times of dense fog, high winds or lowering of temperature, the lessening or cessation of migration was correlated with a total absence of giant swifts. At Kilometer 15, a few kilometers south of the pass, I frequently saw flocks of these birds feeding high in air as I passed in the car; and to the north at Kilometer 30, six or eight pairs of the swifts were occasionally seen hawking about. Beyond these limits I saw no swifts.

Giant swifts are supposed to be normal inhabitants of strictly tropical regions. At Kartabo, British Guiana, at practically sea-level, I found them commonly in good-sized flocks, feeding on flying insects, especially in June, July and early August. During this season, mating flights of ants and termites were frequent.

From March 14 to July 17 I noted the following groups of giant swifts passing on twenty-three days at full speed south through the pass, all between 7 and 8:30 A.M. 1, 16, 6, 2, 11, 4 and 16, 3 and 7, 21, 12, 8, 16, 4, 1, 3, 1, 2, 14, 5, 4, 22, 19, 7, 5. All were in a terrific hurry, flying headlong, mostly low, their whistling wings just clearing the upper branches of bushes and trees. Throughout this period there were only five records of birds going north in early morning and few in numbers, 2, 6, 1, 9, 1. On June 24 at 3 P.M. 64 swifts rushed past over my head, headed full speed northward through the pass, just ahead of the onrolling fog.

On June 6, at five in the afternoon, a compact flock of 200 to 210 birds, at a moderate height, circled northward, giving the impression of a leisurely, non-feeding migration. On August 1, closely intermingling with about five thousand Argentine martins, *Phaeoprocne tapera fusca*, about 300 giant swifts accompanied the other birds, all at high speed. On August 8, 24 swifts passed low, going north through the pass.

The assumption of the northward return every afternoon and evening of these swifts through Portachuelo Pass seems justified because of the number of birds which long after dark on nights of storm or fog struck against the windows of our laboratory. These accidents occurred from 7:20 to 10:45 P.M. Fourteen birds struck in this way on eleven nights, April 9, 12, 18, May 4, 16, 23, June 10, 27, July 3, 4 and 6. On three nights two birds appeared. Four of the swifts which crashed the windows were skinned, three others were sexed, and the remaining seven escaped. All examined were males, and, of those examined, only the two birds which struck on April 9 were in full breeding condition.

Reviewing the records through the pass, it seems reasonable to assume a daily migration from some more northerly sleeping or breeding place, south to a feeding area, with the return very late in the afternoon or in the evening.

On May 4, four of these swifts fearlessly attacked a bat falcon, the male of the pair whose nesting we were watching. In connection with the attacking and repulsing of this hawk by the the swifts, we were interested to see the same individual falcon on three separate occasions return to his lofty perch with a dead swift. This is a remarkable feat when we realize that the latter is only about one-quarter less in size than the hawk. In an active flight dive the falcon could strike and capture any small bird it selected, but on a level the swifts were superior.

In the Santa Marta mountains of Colombia, about 575 kilometers west of Rancho Grande and at an altitude of 1,500 meters, this giant swift has been found nesting (Todd and Carriker, 1922). The account is as follows (p. 245): At the coffee plantation of Cincinnati, "on March 19, 1917, a colony of this large swift was discovered nesting in a shallow cavern behind a waterfall. The place was absolutely inaccessible, so that no idea of the number of nests could be had. Only one nest, which happened to be near the top, was secured, together with the occupants, . . . which had been stunned by the blasting, and proved to be an adult female and two recently hatched young. The nest resembled very closely that of the Chimney Swift, being composed of twigs fastened together with saliva. The birds entered and left the cavern by dashing through the curtain of water falling over the front of it. The altitude of the site was about 4,300 feet."

DATA ON COLLECTED SPECIMENS.

For comparison I have included data concerning a female of this species taken many years ago at Kartabo, British Guiana.

		Lgth.	Wing	Tail	Grams Weight	Extent	Date	
30447	male	205	194	64	105.8	501	July	3, 1945
30452	male	196	188	61	96	482	July	3, 1945
31135	male	202	195	67	68.5	500	April	9, 1948
31188	male	210	200	70	109.5		July	6, 1948
529	female	190	190	60	77.2		July	10, 1919

The relative discrepancies between length and weight are accounted for by the food. The stomach, with contents, of No. 31188 weighed 22.6 grams. Gross food content may be expressed as follows: 30447, crammed with ants; 30452, moderately filled; 31135, empty, after a day in cage; 31188, crammed with ants; 529, only about one-fourth filled with insects. Without exception, all the ants in the food were winged females.

Detailed Food.

30447: At least 800 ants of an undetermined species of *Azteca*.

30452: Several hundred females of *Dolichoderus (Monacis) debilis* Emery, and *Crematogaster (Orthocrema)* sp. A single female *Solenopsis geminata edwardi* Forel.

31135: Five female *Atta* sp. More than four

hundred winged females of small ants.

31188: Stomach crammed with ants. (Weber).

Homoptera: Cicadellidae.

Diptera: fly fragments.

Hymenoptera: parasitic sp.

Hymenoptera: *Pheidole* sp.

Hymenoptera: *Atta sexdens* Linn.

Four gasters and a hind wing fragment. A species known from Ciudad Bolivar, Venezuela, and south. Found in Eastern British Guiana, but apparently not in Venezuelan Guiana, the Orinoco Delta, N. W. District (B.G.); in these places replaced by *A. cephalotes* Linn.

Azteca?: wings.

Camponotus (Myrmobrachys) sp. Same as I took at 1,020 meters in Rio Porce, Colombia.

Camponotus (Tanaemyrmex) substituta Emery. Distribution: Central America to Paraguay. I have the same form from Kartabo, B. G.

Camponotus (Myrmobrachys) crassus Mayr. Distribution: South America.

529: Three beetles, three wasps, one hemipteron, three membracids, one tipulid, and upwards of two hundred female ants of six species.

It is significant that although swifts 30447 and 30452 struck the laboratory within six minutes of each other, yet their food was quite distinct, indicating very different feeding territories. Yet they were headed for the pass, focusing upon a sixty-foot-wide bottleneck.

INDIVIDUAL CHARACTERS.

I find the following recorded concerning the Kartabo female, No. 529:

Parasites: Only a few bête rouge on the head feathers.

Colors: Bill black, face pale medici blue, iris light brownish-olive, legs and feet vinaceous slate.

Eyelid: Quite bare above. Below, a line of fifteen small feathers along rim. At posterior end of eye a small group of a dozen feathers, arranged in several rows.

Oilgland: Elongated, blunt, tapering, bare.

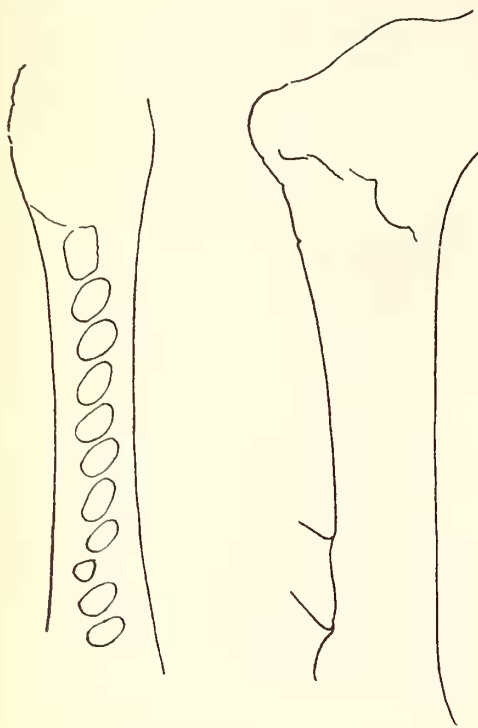
Wing Graph: Primaries

10th—152 mm.	5th—111 mm.
9th—155 "	4th—98 "
8th—149 "	3rd—86 "
7th—139 "	2nd—75 "
6th—126 "	1st—62 "

Secondaries

1st—49 mm.	5th—53 mm.
2nd—50 “	6th—53 “
3rd—52 “	7th—49 “
4th—54 “	8th—42 “

Scalation: Front of tarsus with an indistinct irregular line of ten, fleshy scales down the inner aspect. Inner, rear and outer sides of tarsus, bare, wrinkled skin, with no trace of scales.



TEXT-FIG. 1. *Streptoprocne zonaris albicincta* (Cabanis). Scalation of tarsus, front and side views.



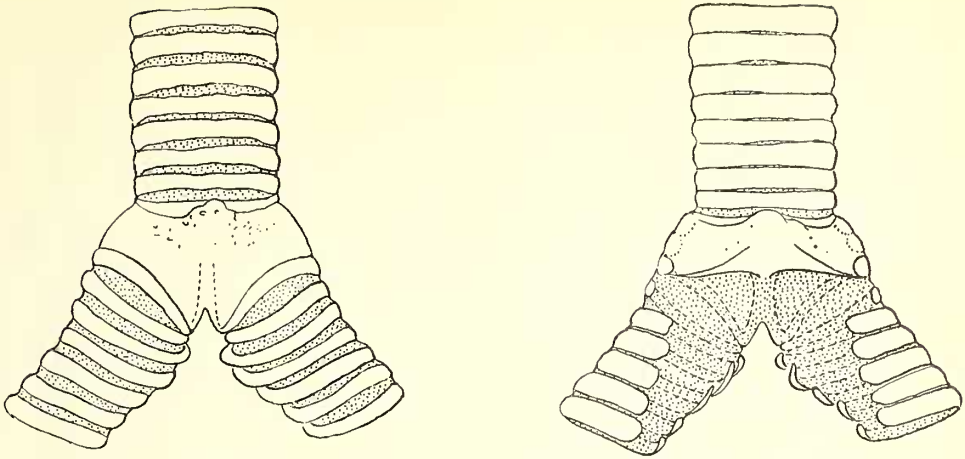
TEXT-FIG. 2. *Streptoprocne zonaris albicincta* (Cabanis). Tongue.

Palate: The palatine fissure begins well toward the front of the roof of the mouth, and divides in front. It is rather long (12.5 mm.) and is guarded by about a dozen pairs of teeth. Four-fifths of the way back there is a double-curved or angular transverse row of teeth, extending out at right angles on each side, with about twenty teeth on each side. The guardian, denticulated flaps end openly posteriorly, and just beyond is the very small tubal fissure. At the extreme posterior of the roof of the mouth is a transverse row of about twenty weak teeth.

Tongue: Narrow for a swift, and small for the size of the mandibular area. Greatest width of tongue 5.7 mm., length 10; greatest width of mandible 20 mm., length 26. Tongue fleshy, channelled toward the tip, sides somewhat sinuate, tapering slowly to two blunt tips. The two cornua are lined along the edge, both on inner and outer sides, with strong teeth. Smaller ones are scattered over the posterior surface of the tongue itself.

Glottis: A narrow ellipse on a low flat area, with inconspicuous unarmed rim. Posteriorly, there is an irregular transverse row of teeth, all large, flattened, sub-equal in size and numbering about fifteen on each side. Beyond these there arises a second irregular row. Most of the teeth, in a cleared condition, show stout, parallel-sided bases, and slender tips.

Syrinx: Swift No. 31135 (KOH No. 2589). Male. April 9, 1948. There is little change in the posterior tracheal rings except that the last eight are slightly narrowed with more even edges. The syrinx is a wide tracheo-bronchial collar of bone. Anteriorly the upper margin is level except in the center where an irregular, rounded projection overlies a segment of the last tracheal ring. This, like the rest of the syringeal collar is ossified and coarsely fenestrated. The anterior vertical width of the collar is 1.6 mm., its lateral, front to back, length is 3.3 mm. The lower border of the collar is formed by the closely-applied, strongly arched, upper bronchial



TEXT-FIG. 3. *Streptoprocne zonaris albicincta* (Cabanis). Syrinx, front and side views.

semiring. This semiring dips far down in front, forming an acute angle with the pessalus. The triangular space within this angle, as far anterior as the collar, is ossified, but without fenestration.

Posteriorly the tracheal rings are appreciably wider, with little more intervening membrane showing than the median, open notches. Two of the rings anastomose. The two lowermost rings are narrow and even as to outline.

Posteriorly, the syringeal collar is similar to its anterior half, with the difference that this aspect is flat and the median anterior projection is less pronounced. There is a faint but distinct indication that the present ossified syringeal collar was originally composed of two rings. The entire ventral syringeal aspect, bounded by the lower border of the collar, the pessalus and the first semiring is of course membranous. The free ends of the anterior semirings, joined by the tympaniform membrane, narrow rapidly posteriorly, until the ninth onwards become almost complete rings, thus forming the end of the membrane. There are about twenty-three bronchial rings, the second, third and fourth being somewhat longer, projecting slightly into the inner profile of the bronchi. From the eighteenth bronchial ring onwards there is a gradually increasing disintegration of the rings within the lung tissue, a thinning and irregular anastomosing of adjoining rings.

A drawing and description of the syrinx of the female No. 529, made thirty years ago, are similar to that of the present male except that posteriorly, the median protuberance is considerably larger, and extends forward over the last three tracheal rings.

Chaetura brachyura brachyura

(Jardine, 1846).

Short-tailed Swift.

Species Range: Same as that of the sub-

species below, with the addition of the Lesser Antilles.

Subspecies Range: Northern Venezuela and the Guianas to Trinidad and Tobago, south through eastern Ecuador and Peru to Matto Grosso and Pará.

Field Characters for Sight Identification: This is the smallest of the Rancho Grande swifts (length 100 mm.). On the wing it appears totally black, with conspicuous pale brownish-gray rump, tail-coverts and tail. The absence of gray on the underparts distinguishes it from the slightly larger *cinereiventris*.

Occurrence: By far the commonest swift at Rancho Grande, becoming really abundant after the rains began.

On clear days numbers were often seen feeding with swallows and other swifts, especially when migration of various orders of insects was in full swing. On partly cloudy days or when fog drifted up the lower valleys, these short-tailed swifts would swing through the pass in small or larger numbers.

There was none of the rather regular, southward, morning shift of the giant swifts. We saw this species every month from March to August, and on almost every clear day. It often flew in twos and threes, or again in flocks of considerable size. For three consecutive days, we were able to identify an individual trio. Two of the birds had recognizable gaps in their primaries due to molt, and these marked birds hawked on the north side of the pass, low in the gorge, throughout a three-day flight of termites, *Coptotermes testaceus*. On the third day an onrushing mass of dense fog drove these swifts away in the wake of eight turkey vultures hastening toward the upper zone of clear sunshine. The swifts did not return, and the next day the insect flight had ceased.

On July 9, 1948, we observed an unusual flocking, a migration of sorts; a fairly compact mass of considerably more than four

hundred of these swifts, circling, not feeding. As they approached the pass from the south, the flight changed to a more direct movement, and when siphoning through, all circling ceased, and the rush of wings was like a loud wind as the birds passed low and at great speed. The northern valley was partly filled with fog and the birds rose slowly above it, and before they passed from view, were again circling high in air as before. The general effect was of a maze of inorganic units, without volition, sucked by a wind through the narrow notch, and then sprayed out in a slower movement as the draught lessened. As a matter of fact, there was little or no breeze in the pass itself.

A spectacular coincidental sight of the same type of flocking of the same species is recorded in my notes on an identical July 9, but thirty-two years before, at Kalacoon, British Guiana. The note reads as follows: "An enormous flock of short-tailed swifts appeared over the forest at 9:30 this morning. There were certainly more than a thousand birds, all flying in a great circle, gradually attaining higher and higher altitude. They were massed so closely together that there seemed hardly room for any movement of the outspread, crescentic wings. The relative slowness of movement and the frequent effortless gliding indicated an upward surge of air. Through the glasses a scattering of equally small white-rumped swifts, *Chaetura spinicauda*, was clearly seen. The whole company vanished very high up and drifting southward."

Although these swifts showed little fear of the pair of bat falcons nesting near the laboratory, yet at least seven individuals fell victims to these hawks, and an eighth mangled swift found in the road near the nesting tree indicated an additional dropped item of diet. In this, as in other species, the swifts were able to evade the raptors when on the same aerial level. It was only when the hawks could go into a vertical dive that their speed made them almost unavoidable.

Two short-tailed swifts crashed against the laboratory windows on successive evenings, May 16 and 17, but one was able to fly away. The other was a male, breeding, with the stomach quite empty.

Chaetura cinereiventris lawrencei

Ridgway, 1893.

Gray-breasted Swift.

Species Range: The range of the eight recognized subspecies extends from Nicaragua, Grenada, Tobago and Trinidad south to Venezuela, Colombia, Ecuador, Peru, central Brazil and Bolivia.

Subspecies Range: *lawrencei* occurs in Grenada, Tobago, Trinidad and the mountains of northern Venezuela.

Field Characters for Sight Identification: A small swift. Black, except for rump and all underparts, which are pale gray. When associated with *brachyura* and seen from above at a distance, the birds are much alike, the

brownish shade of the rump of *brachyura* being hardly distinguishable. From below, the gray of *cinereiventris* instantly sets it apart.

Occurrence: This is not common at Rancho Grande, but was observed occasionally throughout May, June and July. Only once, on June 9, did an individual come to the laboratory windows. It clung for five minutes to the sill but evaded all efforts at capture.

On May 9, the male bat falcon caught a gray-breasted swift and plucked it. The female then gave it to her nestlings who tore it apart and ate it. As they pulled it apart I could distinctly see the mass of small ants which filled the stomach, together with two large abdomens of *Atta* queens which were eaten by the young birds.

Chaeturella rufila brunneitorques

Lafresnaye, 1844.

Chestnut-collared Swift.

Species Range: Central Mexico, south through northern South America to Peru, the Guianas and Trinidad.

Subspecies Range: Southeastern Mexico, south to Colombia, Venezuela, Ecuador and Peru.

Field Characters for Sight Identification: A medium-sized swift, about five inches in length. It is the only species marked with chestnut; throat, breast and collar. This color is especially distinct when the birds are silhouetted against the foliage of the mountain jungle, but with glasses is conspicuous even when they are high in the sky.

Occurrence: The chestnut-collared swift was third in order of abundance at Rancho Grande, surpassed only by *Streptoprocne* and *Chaetura brachyura*. It was frequently seen shuttling back and forth through the pass, or hawking about on days of insect migration, associating with giant swifts or with swallows, mostly single birds or in small flocks. Occasionally they would race back and forth through the pass, yet the diurnal observations I was able to make showed no certain regularity of north or southward shift.

On the other hand sixteen birds struck against the laboratory windows and on three occasions, when no swifts actually flew against the glass, individuals were seen fluttering about among the bats within the area of illumination. This would indicate a daily, crepuscular northward migration, as in *Streptoprocne*, also perhaps to some roosting or breeding colony.

Support of the probability of such a migration is furnished by a chestnut-collared swift (31129) taken eight kilometers east of Rancho Grande. A reliable assistant, Pedro Infante, shot this bird January 8, before my arrival, on the Choroní road which parallels that from Maracay to Ocumare. He reported this swift as shot from a group of thirty to forty which, throughout October, November and December assembled every evening and spent the night clinging in a

compact mass to the vertical side of a rocky cliff near the road. All left at dawn. Thus we have evidence of a roosting colony at the same elevation as the pass, and, from the point of view of a volant swift, only a short distance away.

At Rancho Grande the meteorological conditions which induced the appearance of the swifts at the lighted windows were, high but dense clouds; low neblina fog with or without wind; precipitation, whether drizzle or pelting rain and with or without lightning. No birds ever came on clear nights, whether moon or starlighted, and no bird after 10 P. M.

There was considerable variation in the amount of chestnut on the plumage of these swifts, but the typical pattern was rich chestnut throat and breast with a wide collar extending over nape and hind neck. Two adult males had the chestnut reduced to a pectoral tinge, and several swifts on the wing were intermediate between these extremes. The only female examined (31143), an adult, showed no pigmental difference from a full-plumaged male, except that the under tail coverts were strongly edged with white.

Coleoptera spp., including a cerambycid.

Hymenoptera: *Camponotus* sp., fragmentary remains of several hundred.

31132: Half the meal composed of ants (Weber).

Coleoptera spp.

Hymenoptera: *Camponotus* sp., fragmentary.

31143: Dominant food, hundreds of small flying ants (Weber).

Hemiptera spp.

Coleoptera: cucurliionid.

Hymenoptera: *Pheidole* sp.

Hymenoptera: Very small dolichoderine fragments.

Cypseloides cherriei Ridgway, 1893.

White-spotted Swift.

Former Records and Species Range: Two swifts taken on Volcan de Irazu, central Costa Rica, were described by Ridgway in 1893. The type was thought to be a male; the second bird was uncertainly sexed as a female. The most noticeable character was "a large, sharply defined spot of silky white

DATA ON CHESTNUT-COLLARED SWIFTS

		Lgth.	Wing	Tail	Grams Weight	Extent	Date
30382	male	126	123	45	25		May 14, 1945
30382a	male						May 14, 1945
30448	male	133	128	43	22.9	320	July 3, 1945
	Four swifts escaped						July 3, 1945
31128	male	115	120	36		292	Mar. 23, 1948
	One swift escaped						Mar. 23, 1948
31131	male	130	120	43	21.5	295	April 3, 1948
31132	male	128	120	45	21.5	302	April 3, 1948
	Four swifts escaped						April 3, 1948
31143	female	122	125	43	19.5	305	April 24, 1948

DETAILED FOOD.

30382: Many winged females of *Camponotus (Tanaemyrmex) coruscus* F. Smith; and *Solenopsis geminata edwardi* Forel.

30448: A series of winged females of *Crematogaster (Orthocrema)* sp.

31128: Stomach crammed with a mass of winged ants and small beetles. (Weber).

Homoptera: Cicadellidae.

Coleoptera spp., including a carabid.

Hymenoptera: parasitic sp.

Hymenoptera: *Crematogaster* ? wing.

Hymenoptera: *Solenopsis geminata* Fabr., widespread in the northern neotropics and replaced in the south by *saevissima* F. Smith, from the interior of British Guiana (Courantyne) and Brazil.

Camponotus sp.

31131: Food dominantly flying ants (Weber).

Hemiptera: wing.

on each side of the forehead, immediately over the lores, and a short streak of the same color immediately behind the eye." A third specimen was reported (Zimmer, 1945) in a collection of birds from Colombia. This was taken at San Gil, Santander, and was also questionably sexed as a female.

This then, on February 26, 1948, was the summation of our knowledge of the white-spotted swift. The Costa Rican birds came from the same 10th degree of north latitude as Rancho Grande, but 1,800 kilometers west; whereas the Colombian swift, from 6 degrees, 33 minutes north latitude, was 750 kilometers to the southwest of our laboratory.

Field Characters for Sight Identification: The white-spot is a five-inch swift, appearing uniformly black, with a conspicuous, round, white spot between beak and eye. These spots stand out strongly whenever these birds are seen head-on in flight or from the side, giving a rather fantastic impression of a slightly misplaced pair of brilliant eyes.

Occurrence: At 9.30 o'clock in the evening

of February 26, 1948, a white-spotted swift came to the windows of Rancho Grande and was caught. From this time until June 13 we captured or recorded eight others, making a total known of this unusual species of twelve individuals. The details of the nine Rancho Grande birds are as follows.

31125: Female not breeding. February 26, 1948. Length 132, wing 123, tail 132, extent 308 mm. Black above, sooty brown below; supra-oral spot and small post-ocular patch white; small feathers along edge of wrist and front of wing white-edged; trace of white on chin. Ovary small but distinct.

At 10 P.M. this bird fluttered against a bedroom window. It was later found and captured on the Rancho Grande porch, fluttering confusedly around the electric light. The evening was one of dense fog, with a strong breeze blowing from the southwest.

Food: A mass of rather comminuted flying ants. (Weber).

Coleoptera spp.

Hymenoptera: Highly fragmentary *Camponotus* sp., forming most of the contents.

31133: Male, not breeding, April 4, 1948. Length 120, wing 120, tail 39, extent 305 mm. Weight 22.5 grams.

Frontal spots large and pure white, beginning on lores with only a few feathers between them and nostrils, and extending back over eye frame, and on a narrow line to midway over eyes, thus approaching the post-ocular spot. This latter forms the posterior border of the feather circle around the bare area on the lower lid. When the eye is closed and this lid drawn up, the spot is directly behind the eye. When the eye is open it is behind and below eye. Wrist edge of wing and rim featherlets all have distinct white edges. The chin is grayish-white.

The bird was caught at 8:30 P.M. as it clung to the vertical electric light wire depending from the ceiling of the porch outside the laboratory. There was sufficient fog to hide the stars and the recent wind had died down. The air was cool, 62 degrees Fahrenheit, sufficient to keep all moths away.

Food: Flying ants. (Weber).

Coleoptera spp.

Hymenoptera: *Camponotus* sp.

Syrinx: *C. cherriei*, No. 31133 (KOH No. 2588) differs from *Streptoprocne zonaris albicincta* in there being three, instead of two, rows of post-glottid teeth. The syrinx proper, although completely ossified, shows distinctly its composition of three rings. The median anterior protuberance is directly connected with a slight, posterior, cartilaginous projection of the lowermost free tracheal ring.

31134: Female, not breeding. April 5, 1948. Length 137, wing 127, tail 51, extent 310 mm. Weight 25.5 grams.

Large white preocular spots almost join white chin. Postocular and white wing edges well developed. Flew against laboratory windows at 7:30 P.M. in dense cold fog.

Food: Stomach crammed with insects, one-half of which were ants (Weber).

Hemiptera spp.

Coleoptera spp.

Hymenoptera: parasitic sp.

Hymenoptera: *Camponotus* sp. fragmentary.

Hymenoptera: dolichoderine wings.

April 5. At 7:45 two more white-spots came to the porch but both escaped. At 8:10 another bird came and went. In all, the mental white was almost absent.

April 11. In dense, drenching fog a white-spot came to my bedroom window at 9:30 P.M. and clung out of reach to the rough surface of a cement pillar. Eye-white as usual, with more on the chin than in any bird hitherto seen.

May 10. Male bat falcon caught a white-spot, held it for three minutes, with the dangling head in full view. Hardly any mental white, but very large and fluffed out eye spots. After plucking it he gave it to the female who fed her young.

June 13. Female bat falcon brought a swift to her perch, and had begun plucking it when the young male flew up, took it and ate it.

Cypseloides cryptus Zimmer, 1945.

Tropical Black Swift.

Former Records and Species Range: In 1945 a new species of swift was described (Zimmer, 1945). The type came from the Rio Tavera, Peru. Only four other specimens were known, taken at the following localities: British Guiana (Kaieteur Falls), Venezuela (Mt. Auyan-tepui, and Saroropan-tepui), and Costa Rica (San Pedro).

Only a single individual of this species was seen at Rancho Grande in 1948. The two which were taken in 1946 have already been reported by me (Beebe, 1947), and I here repeat several paragraphs.

Field Characters for Sight Identification: This five-inch black swift would show no definite characters in flight except the general black coloration. The grizzled and variable dull whitish of the lores and chin could hardly be detected.

Occurrence: On April 20, 1946, a female of this swift crashed against the laboratory windows at Rancho Grande at 8:30 o'clock in the evening and was stunned. It is No. 30,634, female, not breeding, fairly fat, weight 40.2 grams. Length 120, wing 137, tail 48, extent 355 mm. The stomach was filled with winged female *Azteca* ants.

On April 21, the following evening, at the same time, a second bird killed itself against the identical window. This is No. 30,640, female, not breeding, considerable fat, weight 35.8 grams. Length 138, wing 130, tail 50 mm. First primary in each wing half grown.

Food: A great quantity of *Crematogaster* and *Azteca* flying ants.

April 12, 1948. At 10:15 A.M. the male bat falcon swung up to his perch in the top of the candelo tree, with a swift. Through the

20-power glasses I could see every detail and in every respect of the cephalic pale color it seemed to be this species. There was no trace of the supraloral white spots of *cherriei*, and the area around the base of the beak showed the pale grizzled appearance so apparent in both of the specimens taken in 1946. I could have had no more certain evidence if the bird had been in my hand. It was slowly and thoroughly plucked and as the female did not appear, the male proceeded to eat the eighth known individual of *Cypseloides cryptus*.

Aëronautes montivagus montivagus

(d'Orbigny and Lafresnaye, 1837).

White-breasted Swift.

Species and Subspecies Range: Mountains of northern Venezuela, Peru and Bolivia.

Field Characters for Sight Identification: A small five-inch swift. Easily distinguished by great extent of ventral white, no nuchal collar, and almost square tail.

Occurrence: Known at Rancho Grande laboratory from a single specimen which flew into the porch in dense neblina, and at about 9:15 P.M. was caught as it crouched in a corner.

31142: Adult male, breeding, testes 8.5 mm. April 23, 1948. Length 120, wing 110, tail 40, extent 266 mm. Weight 20 grams.

Food: Many flying ants and small cucurlioid beetles (Weber).

Hymenoptera: ponerine and *Camponotus* ant fragments.

Parasites: This swift was strongly infested with parasites, one of which (48375) was a giant feather fly with bright green abdomen. In addition, there were several *Mallophaga*, and a number of *bête rouge*.

Dr. J. Bequaert has kindly identified the large feather fly, and sends me the following note:

"The fly is *Brachypteromyia neotropica* J. Bequaert. This was described from a single male, taken from the same host species, at Galipan, close to Pico Avila, Estado Miranda, 2,000 meters elevation, Venezuela.² Yours is the second specimen known, also a male. The description, with figure, is in *Psyche*, 49. (1942) published in 1943, p. 113. The only other species of the genus, *Brachypteromyia fimbriata* (Waterhouse), is North American, on the swifts *Aëronautes saxatilis* and *Nephoecetes niger*."

In addition to the single captured specimen of this swift, we have three other records.

June 19, 1948. Six white-breasted swifts flew, one after the other, through the pass at 10 A.M. They were headed south and not flying very fast. While still in sight two of the birds veered aside from their direct flight and caught insects.

June 21, 1948. A compact flock of twelve of these swifts swung south through the pass at 8:05 in the morning. They flew very low, just skimming the trees.

Three of this species were caught by the male bat falcon; on April 4, June 10 and 19, 1948.

Panyptila cayennensis (Gmelin, 1789).

Fork-tailed White-collared Swift.

Species Range: Southeastern Nicaragua, south over Colombia, Ecuador, Venezuela, Tobago, Trinidad and the Guianas to Bahia and São Paulo.

Field Characters for Sight Identification: A five-inch swift, unmistakably fork-tailed, black except for white eye-spots and flank-spots, chin, throat and collar.

Occurrence: 30439: A male flew against the windows of the laboratory and was badly injured. July 1, 1945. Length 123, wing 125, tail 57 mm.

Food: Small species of flying ants.

(This specimen was overlooked in the paper on Avian Migration at Rancho Grande, Beebe, 1947).

June 8, 1948. Six fork-tailed swifts hawking about early in the morning with three blue and white swallows, over the compound of Rancho Grande.

June 12, 1948. A swift of this species caught and eaten by male bat falcon.

SUMMARY.

At Rancho Grande a total of eight species of swifts were collected or observed, out of the thirteen species recorded from Venezuela as a whole. The types of observation resolve into: flocks feeding at various altitudes, others migrating through Portachuelo Pass usually low down, or striking against the lighted windows of the laboratory on nights of fog or rain. Finally a number of the birds were caught by a male bat falcon.

Throughout twenty months of residence during three years no swift was seen to alight, nor was there at Rancho Grande first-hand proof of breeding or roosting colonies, although the latter were indicated as a result of various activities.

Observations in adjoining areas, both higher up the surrounding mountains, and down to four hundred and forty-five meters on the Maracay plain, showed a relative dearth or absence in comparison with their numbers in the square kilometer whose center was Rancho Grande and the pass. The obvious explanation of this concentration of swifts, by day and night, must be the same as that of many other organisms, both vertebrates and invertebrates; viz., the continual procession on migration of countless numbers of insects representative of almost every order, traversing the sixty-foot-wide pass, from north to south, on every clear day throughout the rainy season. This abundant and ever renewed source of food was obviously a focusing factor of prime importance.

A second reason for the abnormal numbers of species and individuals was the use of the pass by several of the species on daily migration from a presumed breeding or roost-

² Pico Avila is in the immediate neighborhood of Caracas, about 100 kilometers due east of Rancho Grande.

ing place to a trans-pass feeding-area. It is difficult otherwise to account for the forty-four specimens of all eight species taken or observed on black nights of poor visibility. Of twenty-two specimens sexed, seventeen were males, five females.

The presence throughout their breeding season of a pair of bat falcons, close to Rancho Grande, revealed an interesting relationship between these birds and the swifts. The latter showed little fear of the small falcons when these were perched, and giant swifts did not hesitate to attack and drive off the male hawk. Yet I recorded nineteen individuals and seven out of the eight species of swifts as entering into the diet of the hawks. When high in the sky, a power dive attack of the male falcon rendered escape impossible on the part of the swifts, but when the birds met at horizontal levels, the speed and dodging ability of the small birds rendered them safe.

The flocking habits of these Venezuelan swifts are, in some ways, suggestive. Single birds were very rare, and pairs were not often seen. But, especially in mid rainy season months, trios were common. Even in flocks of twenty to fifty, feeding in midair, subdivision into trios was often evident. If the same rule of a single surviving young holds in tropical swifts as in many other tropical birds, these trios probably represented the season's families. Larger flocks in rapid movement were too infrequent to warrant definite classification or object.

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EXPLANATION OF THE PLATE.

PLATE I.

Two migrant swifts which came to the electric lights of Rancho Grande on nights of rain or fog.

Fig. 1. Giant White-collared Swift. *Streptoprocne zonaris albicincta* (Cabanis).

Fig. 2. Chestnut-collared Swift. *Chaeturella rutila brunneitorques* Lafresnaye.